RHIC Bulletin
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RHIC Magnet Production: Dipole Phase I Complete

On September 30, 1994, Northrop Grumman delivered the thirtieth dipole magnet to Brookhaven. This completed the Phase I production during which magnet technology was transferred from BNL to Northrop Grumman, tooling was built, and production was begun. Just before Thanksgiving, 1994, all thirty Phase I dipoles successfully completed cold horizontal testing after an intensive effort by BNL staff.

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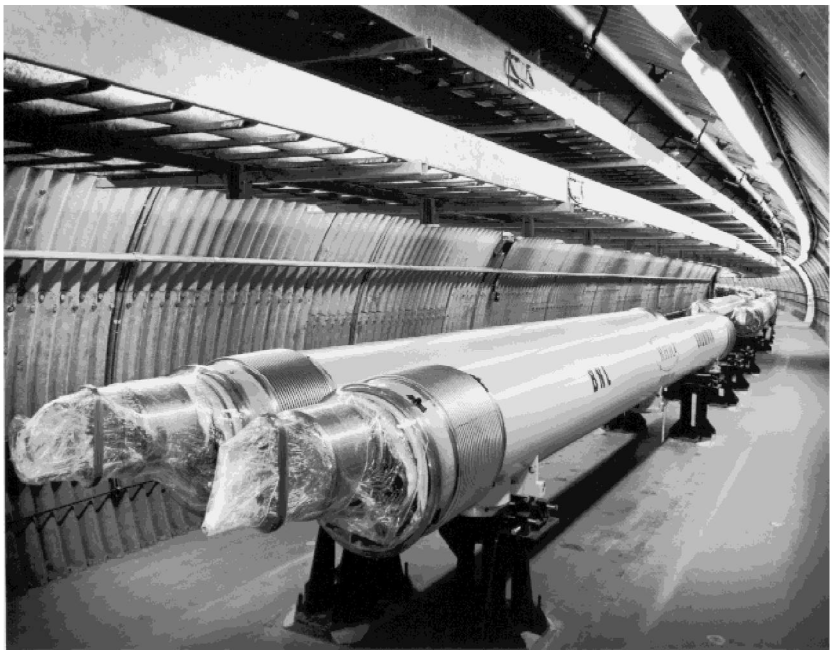
RHIC Tunnel Installation: The Dipoles Come Marching In



The completed dipoles have marched steadily into the RHIC tunnel. The first dipole magnet was lowered onto its stand on August 5, 1994. As of January 1, 1995 (just a few months later) a total of 36 more dipoles had followed the leader (see photo).

Over the last few years much work was begun on the installation of both support equipment and machine components into the tunnel at RHIC.

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Progress All Around the Ring

-- Satoshi Ozaki, RHIC Project Head

It is my pleasure to announce that we are restarting publication of the RHIC Bulletin. The RHIC Bulletin has an important purpose: to keep everyone who is interested in the project well informed. Under the editorship of Brant Johnson, I am confident that we can keep you up to date on the status of RHIC.

I am very pleased to note that there is much tangible evidence demonstrating the significant progress made during the first four years. The articles in this Bulletin describe a few highlights of past accomplishments. Future Bulletins will highlight other developments as we continue our steady progress.

The RHIC construction project, which began in FY 1991, is now at the halfway mark, and is scheduled to be completed in mid-FY 1999. Construction funding through the fiscal year 1995 adds up to about 60% of the total estimated cost (TEC) of $ 475 million. Because there is considerable value in preexisting facilities, such as the injection system (Tandem Van de Graaff - the Booster - the AGS - transfer lines), the existing 3.8 km tunnel, and the 24 kW helium refrigerator, the total value of the RHIC facility when completed will approach (or may exceed) one billion dollars.

The accelerator lattice design was finalized in 1992 after intensive study to optimize the collider design for performance, operational flexibility, and cost effective engineering. This lattice design has remained stable and has continued to be the basis for the detailed design of accelerator hardware.

Civil construction to connect two short sections of the tunnel enclosure left unfinished from the previous project, to establish magnet access ports to the ring tunnel, and to build six service buildings for power supplies and cryogenic control boxes is complete. For most of the collider technical components, the detailed design is complete and the fabrication, either by industry or at BNL, is well underway. In addition, installation of the collider infrastructure and technical components has begun in earnest in the 3.8 km tunnel. Magnet stands and cable trays are in place in most of the ring.

A big event took place on August 5, 1994 in the RHIC tunnel near the six o'clock hall. The first Northrop-Grumman-built dipole magnet was placed on the magnet stand by BNL Director, Nicholas P. Samios. Since then, the activities in the tunnel have increased at a steady pace. To date, more than 45 dipole magnets have been brought into the tunnel. In fact, all arc dipole magnets for one of two beam lines, and about 2/3 for the other beam line are in place at the 5 o'clock sextant as seen in the photograph on the front page of this Bulletin. The 600 m long beam injection line that connects RHIC to the AGS already contains all but a few of the room-temperature magnets that are currently being connected.

Production of superconducting magnets, which is the most significant undertaking in the RHIC Project, is proceeding very well at industry and at the BNL magnet facility. Another big event in this regard is the successful completion of the Phase I portion of the dipole magnet contract with Grumman Aerospace Corporation (now Northrop Grumman) on September 30, 1994 as scheduled. Phase I was the technology transfer to Grumman, tooling setup, and the initial production of 30 magnets. The Quench performance of all magnets tested at the cryogenic temperature of 4.6 K is excellent, the excitation current at the quench-plateau comfortably exceeds 6500 A, 30% above the operating current of 5000 A. The magnetic field quality of all magnets is good and quite uniform from magnet to magnet, eliminating the need to shuffle magnets to meet collider lattice requirements. Since October 1, 1994 Northrop Grumman has begun routine production of the dipole magnets, which will increase to the level of one dipole magnet per day in the near future. The target date of completion of dipole magnet manufacturing remains in mid-1996, well ahead of the scheduled date at which they are needed.

The main thrust of activities in the RHIC magnet facility, now, is directed toward assembly of so called "CQS" units. The CQS unit consists of one each of corrector coil assembly (manufactured at BNL), quadrupole magnet (manufactured by Northrop Grumman), sextupole magnet (manufactured by Everson Electric Co.), and the beam position monitor (supplied by the RHIC Instrumentation Group). All are combined into one cold mass unit, and inserted into a cryostat. Just as good quality and good alignment of lenses defines the quality of an optical system, the quality and alignment of magnets in the CQS unit, for that matter throughout the ring, defines the quality of the colliding beam optics. Northrop Grumman's quadrupole magnets are as good as their dipoles. Everson Electric has successfully completed the delivery of 288 quality sextupole magnets. Manufacturing of corrector assemblies by BNL, again of good quality, is well ahead of the CQS assembly schedule.

There are now over 700 official participants in the four RHIC experiments (STAR, PHENIX, PHOBOS, and BRAHMS). The detector collaborations are truly international, with participants from over 60 institutions in a dozen different countries worldwide. It is very impressive to see so many scientists, engineers, and students working toward the exciting physics program at RHIC. The two major detector programs, STAR and PHENIX, are in the construction phase, and have shown good progress to date. Major procurements (e.g., magnet coils, magnet structures, field cages) are all well underway, as well as the R&D, design, and fabrication of detector components at participating institutions. Of the two small detectors, PHOBOS has been approved by the BNL HE/NP Program Advisory Committee (PAC) and is awaiting approval for construction pending the funding forecast. The other detector, BRAHMS, has submitted a formal proposal for PAC review. The four RHIC detectors will provide for a complementary set of investigations to discover and explore the new states of matter produced at RHIC.

Getting Restarted: Revival of the RHIC Bulletin

I am pleased to have been asked by Satoshi Ozaki and Tom Ludlam to oversee the revival of the RHIC BULLETIN. The purpose remains the same as stated by Satoshi in the first issue: "It is our hope that a periodical publication of this news bulletin will keep you and others in our community informed on the status and the progress of the Relativistic Heavy Ion Collider project at Brookhaven National Laboratory, and in turn will facilitate a continuing support and participation by those who are concerned in this important project of our research community."

In each issue we plan to include brief updates on all aspects of the RHIC project, along with a few "in-depth" news articles on the most significant developments. Regular features at the back of each issue will include Coming Events and How to Reach Us. We welcome your feedback and suggestions. For Coming Events please send us the dates and a brief description of any planned meeting or activity of relevance to RHIC. We also welcome feedback and the submission of material for potential news articles of interest to the RHIC Community. Thank you in advance for your involvement and support.

Brant Johnson, Editor

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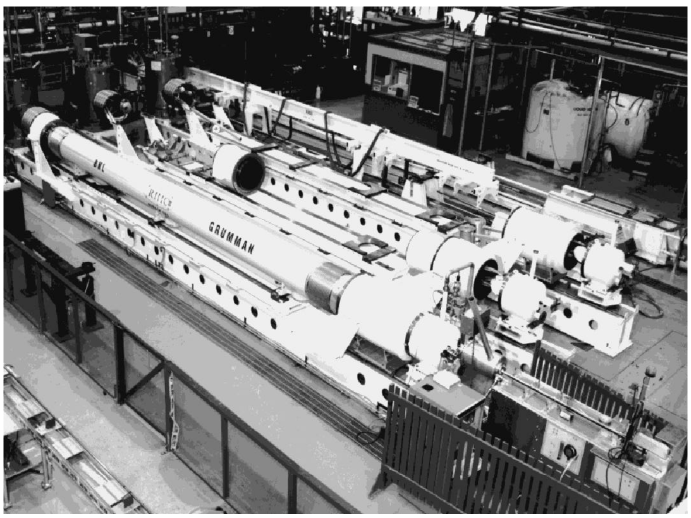
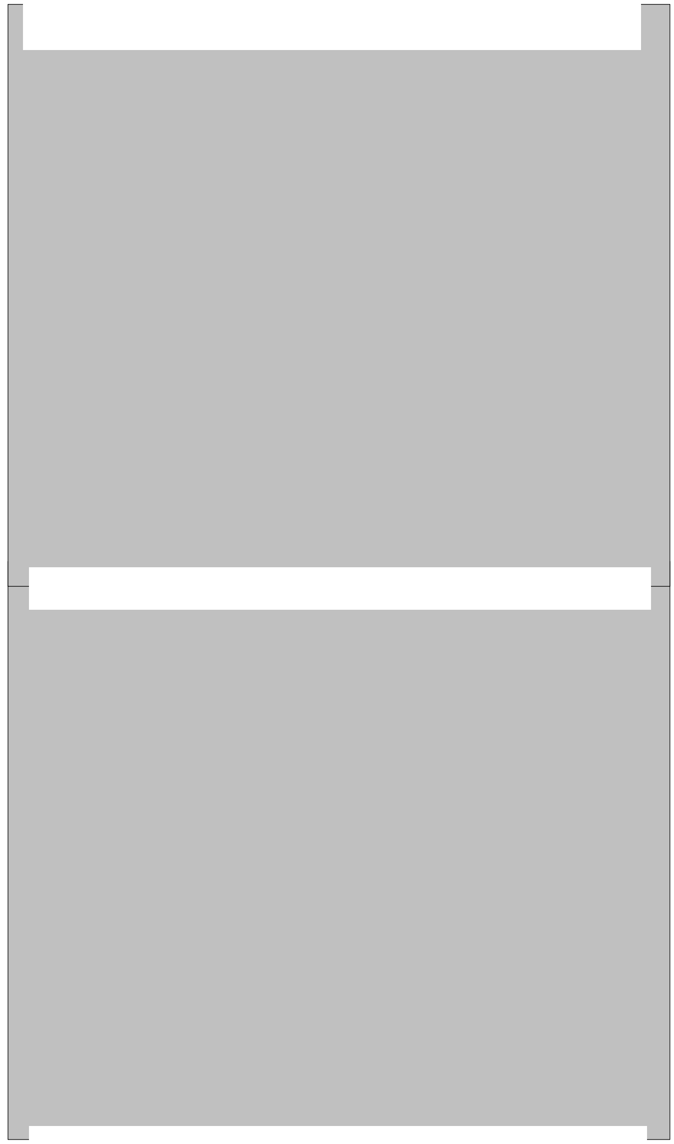
Magnet Production (Continued from Page 1)

The photo below and the figures to the right show the BNL test facility and quench results for the RHIC dipole magnets. A magnet is *quenched* by ramping the applied electrical current up to the point when the coil ceases to be superconducting. The quench plateaus of all magnets tested so far are generously above a 30% operating margin. Furthermore, the magnetic field quality is substantially better than previous achievements in production machine magnets.

The completion of Phase I of the RHIC magnet dipole production is a noticeable success, because it marks the very first time that accelerator superconducting magnets have been produced by U.S. industry. Intensive design work and preparations have been underway for many years at BNL. Credit is due to the staffs at both BNL and Northrop Grumman who worked long, hard, and very effectively on the technology transfer and production startup. With these key accelerator components meeting all design goals, we look forward to the operation of superconducting accelerator rings with extraordinary characteristics. -- Art Greene



The RHIC dipole magnet test facility at BNL.



Quench performance results for the first 35 dipole cold masses tested so far at BNL. The test temperature was nominally 4.5 degrees Kelvin. Quenches with the warm bore are not included.

Tunnel Installation (Continued from Page 1)

For example, arc cable trays were attached all around the ring at the top center of the tunnel to service both rows of magnets.

As shown to the right, to organize installation procedures the RHIC ring has been divided into six sextants and twelve sectors. Sextant 4/5 was the first focus of early installation activity, because it is here that the *First Sextant Test* will be performed. In preparation for this important RHIC milestone, cable trays were installed in the three alcove areas of sextant 4/5, and work is proceeding to design and install cable trays in the 6 o'clock injection area.

Work on the cryogenic system for RHIC is also proceeding. The ambient temperature piping header was constructed inside the tunnel on one side of sextant 4/5. Modifications for cold box 5 of the helium refrigerator are in progress. Concrete footings and piers have been poured for the first 15 helium gas storage tanks needed to support the RHIC refrigeration system.

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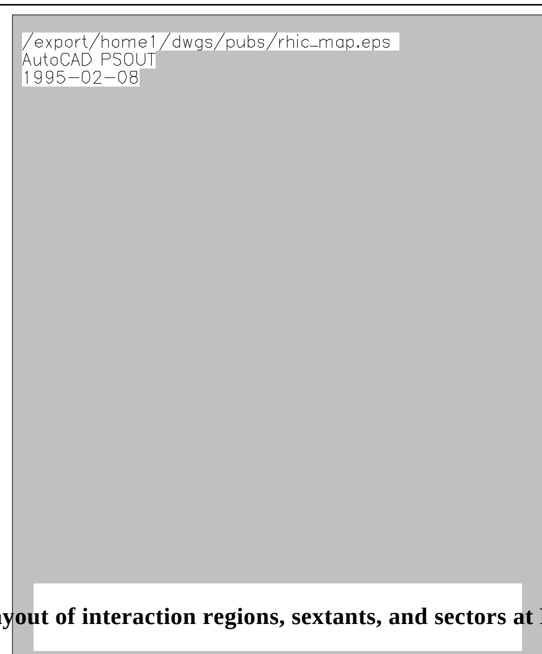


Layout of interaction regions, sextants, and sectors at RHIC.

RHIC Detector Update

I. The "Baseline" Detector Program

At the inception of the RHIC detector program, following a long series of workshops, two rounds of letters of intent, and scientific review of nine proposals by Brookhaven's High Energy/Nuclear Physics Program Advisory Committee, a basic strategy was adopted for the initial complement of RHIC detectors. This includes two large detectors, complementary in their capabilities but together providing a very broad general coverage of the expected signals associated with new phenomena at RHIC, and provision for one or two "small detectors" which could provide the opportunity for more focused measurements with specialized apparatus, and the ability to set up and take data on a shorter time scale.

The two large detectors, STAR and PHENIX, are now well into the construction phase. STAR received final construction approval after a review in January 1993 by the RHIC Detector Technical Advisory Committee (TAC) to establish that the project had the necessary resources and management capability to complete the job. What will be the largest-ever time projection chamber, forming the heart of the STAR particle detection system, is now being fabricated at Lawrence Berkeley Laboratory, and the large solenoid magnet designed at BNL, with an inner coil diameter of 5 meters, is in the beginning stages of industrial fabrication. Ground-breaking is about to take place (Feb. 1995) for the assembly building, adjacent to the Six O'clock collision hall, where the STAR detector will come together before rolling into the RHIC beamline. In addition to LBL and BNL, contracts with the RHIC project are now in place for STAR construction effort at U.C. Berkeley, UCLA, Rice University, and Wayne State University.

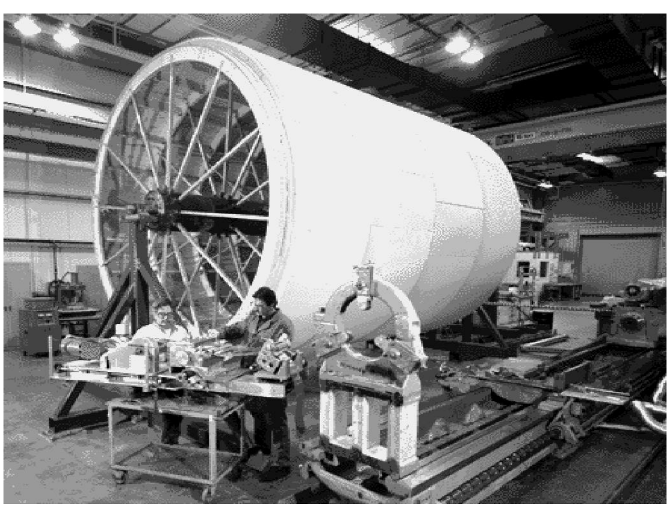
PHENIX began construction, after a similar TAC review process, in March 1994. Fabrication of the PHENIX magnet coil has begun in Japan, and the steel structure of the magnet and muon identifier in Russia. A pre-production prototype supermodule of the lead-scintillator calorimeter has been built at IHEP, Protvino, Russia. In addition to Brookhaven, PHENIX construction work is now underway at Ames Laboratory, Nevis Labs, IHEP (Protvino), Lawrence Livermore Nat. Lab, Oak Ridge Nat. Lab, Los Alamos Nat. Lab, McGill University, PNPI (St. Petersberg), Univ. Tennessee, and Vanderbilt University.

STAR and PHENIX are indeed complementary detector systems. STAR provides essentially full solid angle coverage for charged particles in the central region of rapidity. With nearly complete reconstruction of the charged hadrons over this large acceptance in each collision, it fulfills the role of a global survey instrument to guide the early research in this new energy regime, while at the same time providing the sensitivity to perform detailed measurements of hadronic production and potential signatures on an event-by-event basis. PHENIX is designed to optimize the capability for measuring leptons and photons, the electromagnetically interacting probes which, though relatively rare among the huge multiplicity of particles emitted in a single event, are capable of carrying direct information about the thermodynamic conditions and particle states characteristic of the high-density matter created in the earliest stages of the collision. PHENIX also measures hadrons, but over a necessarily more limited solid angle than STAR.

Two small detectors are under consideration as part of the baseline complement of detectors for RHIC, but have not yet been formally approved for construction. BRAHMS has received preliminary scientific approval, and has prepared a conceptual design report for review in the spring of 1995. PHOBOS has completed a conceptual design report that has been satisfactorily reviewed for technical readiness. Some funding issues remain to be resolved before PHOBOS construction can begin.

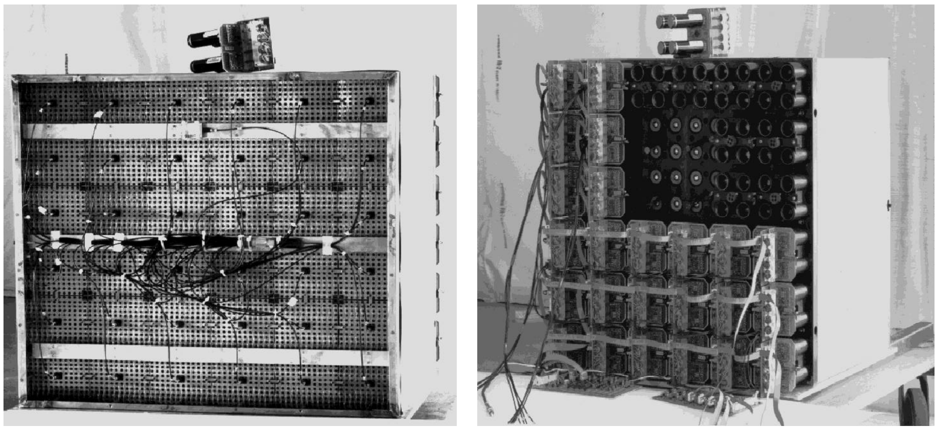
STAR Detector Well Into Construction Stage

Major components of the Time Projection Chamber, solenoid magnet, and electronics for the STAR detector are now being fabricated. Shown below (left) is the mandrel that has been built at LBL for the fabrication of the outer field cage of the STAR TPC. Test wrappings using this mandrel are presently underway and the actual field cage fabrication will begin soon. The assembly and testing procedure for the TPC readout sectors is now well understood and an assembly line is in place at LBL producing the final readout sectors. Shown below (right) are the readout sectors for the STAR TPC being assembled in a clean room at LBL.



PHENIX Construction: EMCal Supermodule Arrives From Russia

The PHENIX detector is also well into construction. Magnets, coils, and detector components are being produced; electronics and computing designs are developing rapidly; and facilities, installation, and integration plans are proceeding apace. One tangible example of PHENIX progress is the arrival at BNL of the first lead-scintillator (PbSc) electromagnetic calorimeter (EMCal) supermodule shown below. This supermodule was developed through a scientific collaboration between scientists from BNL and IHEP (Protvino, Russia), built in Vladimir, Russia, arrived at BNL on December 30, 1994, and is now being prepared for studies in the AGS test beam in March and April of this year.



The PbSc supermodule comprises 144 individual towers, each of which is an optically independent stack of lead plates and scintillating tiles with 36 penetrating channels for inserting wave shifting fibers to collect scintillation light. Assembled in PHENIX with 107 more identical supermodules, the PbSc system will cover an area of about 50 square meters, constituting the largest EMCal ever built. PHENIX will rely on the PbSc system to measure the temperature and time history of expanding thermalized states produced in RHIC.

The BRAHMS design is unique among RHIC detectors in that it aims to measure inclusive production of charged hadrons over the full range of rapidity. PHOBOS exploits a single detector technology (silicon pads and microstrips) to provide a compact device capable of measuring the angular distribution of nearly all charged particles coupled with precise measurement, in a pair of spectrometer arms, of identified particles down to very low momenta ($p_T > 30$ MeV). This device would complement the large detectors in its ability to study fluctuations in physical observables related to very low momenta, and hence to coherent and collective effects of particle production over large distance scales.

By design, there is some overlap in the capabilities of all of the four detectors being prepared for RHIC. All have some sensitivity to the so-called *global variables*, such as total multiplicity, and particle density at mid-rapidity, which can be used to classify events according to impact parameter, energy deposition, etc. All are capable of measuring hadronic resonances and carrying out HBT interferometry, for example. All of the physics agendas have common general goals, and the detector designs, while complementary, are far from orthogonal.

II. Proposed Additional Experimental Equipment

This past September a proposal was submitted to the Department of Energy for Additional Experimental Equipment for the RHIC program. The request, which calls for capital funding over the years 1996 -- 2000, is to extend the physics capabilities of STAR and PHENIX, and to provide needed computing resources for the analysis of RHIC data in a centralized Off-line Computing Facility.

Each of the two large detectors has been designed to have an ultimate physics reach substantially beyond that which can be achieved with the baseline construction project. Largely because of budget constraints, each has begun construction with a minimal configuration to begin a research effort when RHIC turns on, and each has a clearly defined improvement path requiring additional detector equipment. For STAR the proposed additional equipment includes an inner tracking detector (Silicon Vertex Tracker), electromagnetic calorimetry (mid-rapidity barrel plus one endcap), a time-of-flight array covering about one-third of the solid angle subtended by the TPC, and a pair of external TPCs measuring charged tracks at rapidities beyond the main TPC coverage. The proposed additional equipment package for PHENIX includes the instrumentation for the forward muon arm, a high-resolution photon detector consisting of 3600 barium fluoride crystals, and an upgrade of the tracking detectors and trigger electronics to allow electron identification up to very high momenta (over 50 GeV/c).

The Off-line Computing Facility is designed to provide, at the time of RHIC turn-on, upwards of 100 Gigaflops of cpu power and 1000 Terabytes of data storage dedicated to the processing of data from the RHIC experiments. The facility will serve the entire RHIC community and is a critical component of the research program.

The proposed five-year program is intended to bring the new equipment on-line soon after initial commissioning of the RHIC facility, and will not disrupt the baseline detector construction. The Additional Experimental Equipment proposal is currently being evaluated by the NSF/DOE Nuclear Science Advisory Committee (NSAC), which is expected to make a recommendation this spring.

III. RHIC Spin Initiative

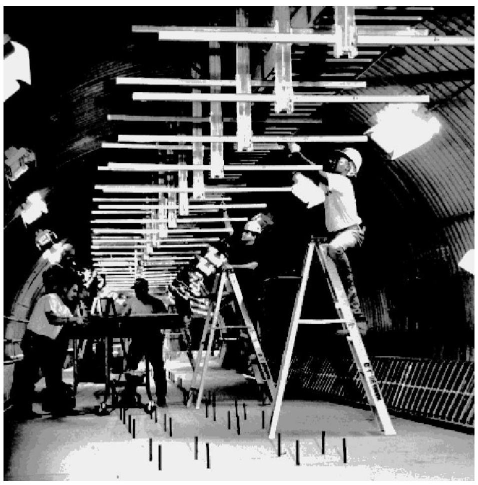
The RHIC Spin Collaboration has proposed to utilize the STAR and PHENIX detectors to carry out a program of spin-related measurements using high-intensity beams of polarized protons in RHIC. The AGS has a long history of accelerating polarized protons, and studies have shown that the RHIC lattice, with some additional components, can accelerate, store, and collide polarized beams injected from the AGS. A luminosity of 2×10^{32} $cm^{-2}sec^{-1}$ is achievable, allowing meaningful data runs in periods of 8-10 weeks per year. The Institute of Physical and Chemical Research of Japan (RIKEN) has proposed an initiative for Japanese funding to implement the spin capability in RHIC (i.e. installation of Siberian snakes, spin precessors, etc.) and to provide a second muon arm for spin measurements in the PHENIX detector. The proposal calls for a total of $20M over five years beginning in April 1995. The first phase ($1.5M) is in the Japanese government's JFY 1995 budget. -- Tom Ludlam

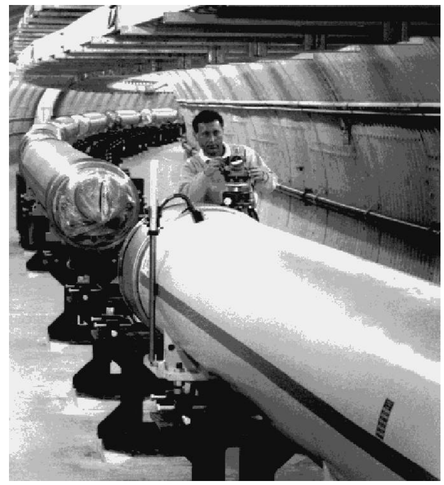
Tunnel Installation (Continued from Page 3)

Supports have been constructed for vacuum jacketed piping that is needed to transfer cold helium gas from the refrigerator to the collider rings in the 6 o'clock region.

The most noticeable installation activity has been in the area of actual magnet placement. As shown in the sequence of photographs below: First, the overhead cable tray supports were installed. Then, the cast iron magnet stands were bolted down and grouted (1100 of the eventual 1744 are already in place). Next, the 37 foot long 5.5 ton dipole magnets (over 45 so far) were positioned on the stands, using a magnet transporter designed and built for this purpose. This Spring, magnet interconnect operations will commence to complete the installation of RHIC magnets.

Further information about the work of the RHIC Collider Ring Division is available through its home page on the World Wide Web. For example, from the main RHIC Home Page (for access information see box at bottom of page 8) you may monitor the current status and progress on the continuing activity of RHIC magnet installation. -- Tom Muller





Zero Degree Calorimeters for RHIC

RHIC experiments might benefit from a common design for a *spectator calorimeter* to characterize heavy ion collisions by measuring the number of non-interacting neutrons. Design work has begun on a Zero Degree Calorimeter (ZCAL) to measure forward going neutrons at RHIC. Details are given in RHIC Detector Note No. 6.

Previous experiments (e.g., E814 at the AGS and NA35 at CERN) have shown that the number of non-interacting *spectator nucleons* emerging from the collision in a fixed target experiment can be measured with a calorimeter downstream of the target along the beam direction. At RHIC, the stored beam occupies the forward direction, but the beams pass through large aperture dipole magnets (D0), which are positioned at about 11 m on either side of each collision point.

Nuclear fragments which have different Z/A from the heavy ion beam will be deflected out of the accelerator vacuum tube by the D0 magnets. Neutrons emitted at zero degrees from RHIC collisions will pass between the beam tubes of the incoming and outgoing beams.

Two major considerations in ZCAL design are accelerator interference and lateral shower containment. Accelerator interference is minimal in RHIC, because warm (rather than supercooled) tubes are used out to about 20 m on either side of the crossing points. Machine components, such as helium transfer lines, have also been kept clear of this region. The current RHIC vacuum chamber design allows the largest possible space for a calorimeter at z = 18 m. However, the beam tube separation at this point is only 15 cm, so edge effects must be considered.

To minimize the effective lateral shower size, the current ZCAL design is based on Quartz fiber Cherenkov light sampling. Tests for NA50 and RD40 at CERN and simulation studies show that Cherenkov sampling of shower secondaries produces a narrow effective shower profile. Cherenkov sampling acts as a directional filter which is fairly insensitive to the diffuse halo far from the shower core.

Even though the mechanical design of a ***standard* ZCAL is well underway for use by all RHIC experiments, there are many open questions about the effectiveness of such a detector for event characterization. Unlike a fixed target electromagnetic calorimeter, the effectiveness of the ZCAL depends on the relative abundance of free neutrons in beam fragmentation.**

Some questions being investigated are: How will the ZCAL complement other event characterization detectors planned for the RHIC experiments? How good are current physics simulation packages for physics with ZCAL? A workshop is planned for later in '95 to bring interested people together to discuss these and other issues related to event characterization with zero-degree calorimeters. -- Sebastian White

Serious Construction at RHIC

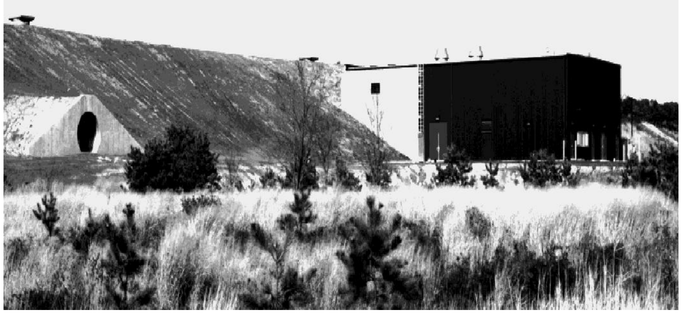
The July 1992 issue of the RHIC Bulletin proclaimed: "RHIC Tunnel Comes to Life" and described the tunnel as "the locale for serious construction activity." Since then, the construction accomplishments include:

- Tunnel closures and service structures at 10 and 12 o'clock.
- Access tunnels at 8 and 12 o'clock.
- Service buildings at 2, 4, 6, and 8 o'clock.
- Emergency power generators at the Collider Center and all 6 beam crossings.
- Electrical substations completed at 10 o'clock and designed for 4 o'clock.
- Cryogenic pipe supports at the Collider Center.

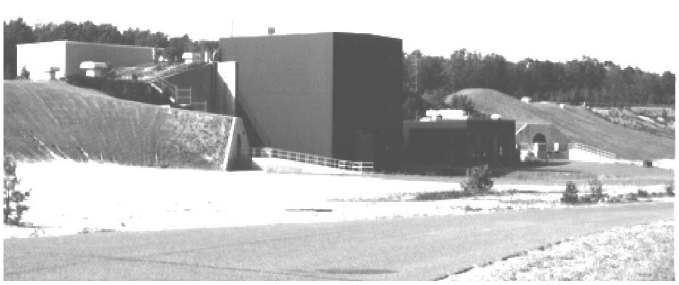
The successful completion of these important RHIC construction projects represents the hard work of BNL personnel from both Plant Engineering and the RHIC project, as well as outside contractors. Seacrest, the major general contractor at the site, successfully completed the last two main tunnel closures. Working in parallel, the general contractor Carter-Melence constructed four service buildings abutting the RHIC ring. Electrical contractors installed the emergency power generators and completed one power substation.

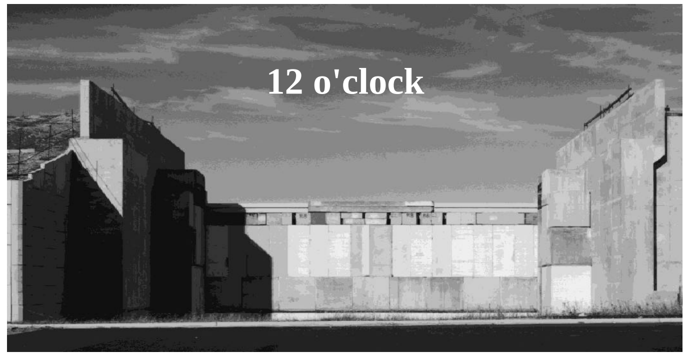
Almost all of the RHIC tunnel construction is now complete. The major future construction activity includes: the STAR Assembly Building at six o'clock, the PHENIX counting house at eight o'clock, and the erection of a shield-block enclosure at four o'clock. Coupled with the other serious activity inside the tunnel, steady progress on conventional construction marches the project ever closer to the golden day when the RHIC tunnel does indeed "Come to Life" with colliding beams and operating detectors. -- George Capetan

10 o'clock



8 o'clock





Working Around the Clock

Progressing counterclockwise around the ring (see layout on page 3), the major conventional construction achievements are:

12 o'clock: A shield block enclosure that is 55 feet long and approximately 11 ft. wide was completed. The four-foot thick slab (elevation 52 ft.) and the 4-ft. high head walls were engineered and constructed to accommodate a future major experimental facility with minimum interruption to the operation of RHIC. New access tunnels allow for installation and removal of magnets and other accelerator components into and out of the main RHIC tunnel. A new service structure adds about 4,000 square feet of work space. A 150 kW electrical generator was also installed and tested.

10 o'clock: The new tunnel segment at 10 o'clock comprises a 300 ft. long, 26 ft. diameter corrugated steel structure with approximately 7,200 sq. ft. of floor area to house the PHOBOS experiment. A new service structure, similar to the one at 12 o'clock, also adds about 4,000 sq. ft. of work space. A 150 kW electrical generator was also installed and tested.

8 o'clock: The Major Facility Hall and Assembly Building here are the future home of the PHENIX experiment. Access tunnels, just like those at 12 o'clock, were added at both ends. A service building was completed on the outside of the ring, providing over 3,500 sq. ft. of work space. A 150 kW electrical generator was also installed and tested.

6 o'clock: The Wide Angle Hall is the future home of the STAR experiment. The main construction activity here was the completion of a service building very similar to the one at 8 o'clock. A 150 kW electrical generator was also installed and tested.

5 o'clock: Between the 6 and 4 o'clock beam crossings sits the Collider Center building, which houses most of the RHIC administration and accelerator personnel, as well as being the probable site of the future RHIC control room. The construction activity here was the installation of a 300 kW electrical generator and cryogenic pipe supports.

4 o'clock: This area is intentionally left open for now to provide magnet and equipment access without the need for building access tunnels. The major construction activity here was the completion of a service building very similar to those at 8 and 6 o'clock. A 150 kW electrical generator was also installed and tested.

2 o'clock: The main construction activity at the future site of the BRAHMS experiment was the completion of another service building, which is similar to the others, except that this service building is on the inside of the ring. A 150 kW electrical generator was also installed and tested.

RHIC Bulletin
Brookhaven National Laboratory

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First Class

How to Reach US

The RHIC BULLETIN is distributed every few months through the RHIC Office at Brookhaven National Laboratory. The staff of the RHIC office will be happy to add new names to the distribution list for this Bulletin, and to provide information or documentation on any aspect of the RHIC project. The Editor welcomes comments, suggestions, and the submission of material for potential news articles of interest to the RHIC Community. Please contact us by:

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RHIC Home Page on WWW

Further information about all aspects of the RHIC Project and the activities of RHIC divisions, groups, and detector collaborations is available through the World Wide Web (WWW). The URL (Universal Resource Locator) for the main RHIC home page is:

http://acnsun10.rhic.bnl.gov/RHIC/

Coming Events

Week of March 13	**RHIC Spin Polarization Review**
March 27-29	**PHENIX TAC Review**
April 13-14 or 17-18	**Accelerator Advisory Committee**
Late April	**RHIC Spin Physics Review**
May 25-27	**PHENIX Collaboration Mtg.**
June 8-9 or 15-16	**AGS/RHIC Users Meeting**
August 7-11	**STAR Collaboration Mtg.**